

LESSON 7: ASPECT AND SOIL MOISTURE



ESSENTIAL QUESTION:

What combination of factors both natural and manmade is necessary for healthy river restoration and how does this enhance the sustainability of natural and human communities?

GUIDING QUESTION:

What role do aspect, slope, sun, snow melt, blackbody absorption and elevation play in soil moisture conditions and why is soil moisture important to the structure of an ecosystem?

OVERVIEW:

This lesson focuses on the role of aspect, slope, seasonal sun availability, snow melt, blackbody absorption, and elevation in soil moisture conditions. Soil moisture is one of the most important factors determining the composition of plant communities and ultimately the ecosystem structure. The amount of snowpack and the amount of time it takes to melt off each summer impacts the growing season and the ability of trees to survive. Where trees can no longer survive, alpine meadows predominate, but soil moisture conditions determine whether they are “wet” or “dry” meadows.

TIME:

One class period

MATERIALS:

- **Lesson 7- Aspect and Soil Moisture.pptx**
- **Lesson 7a- Aspect and Soil Moisture.pdf**
- **Lesson 7- Demonstration/Lab Activity Sheet.doc**
- Metal or Glass Pan
- Shaved Ice
- Black rubber stopper or another dark object
- Freezer and/or refrigerator
- Electric lamp with hot light bulb (100W preferred)
- Reflection Journal pages (printable handout)
- Vocabulary Notes (printable handout)

PROCEDURE:

1. Review the Essential Question. Introduce the guiding Question.

2. Students should take a few minutes to respond to the first reflection prompts. Discuss their answers and any questions they've generated.
3. Hand out the Vocabulary Notes. *With this lesson you may want to define the words before presenting the PowerPoint Lesson.*
4. Present the PowerPoint Lesson
5. Run Demonstration on blackbody radiation absorption
6. Have students use the "sun motion simulator" to illustrate the concepts of aspect and shadows and the impact of latitude on seasonal solar radiation.
<http://astro.unl.edu/naap/motion3/animations/sunmotions.swf>
7. Hand out the second Reflection Journal Page. Give students time for a final reflection on the lesson.

WASHINGTON STATE STANDARDS:

SCIENCE

1. **EALR 4: 6-8 LS2C** The major source of energy for ecosystems on Earth's surface is sunlight. Producers transform the energy of sunlight into the chemical energy of food through photosynthesis. This food energy is used by plants, and all other organisms to carry on life processes. Nearly all organisms on the surface of the Earth depend on this energy source.
 - a. Explain how energy from the sun is transformed through photosynthesis to produce chemical energy in food.
 - b. Explain that plants are the only organisms that make their own food. Animals cannot survive without plants because animals get food by eating plants or other animals that eat plants.
2. **EALR 4: 6-8 LS2D** Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of different species through disease, predation, habitat destruction and overuse of resources or the introduction of new species.
 - a. Predict what may happen to an ecosystem if nonliving factors change, or if one or more populations are removed from or added to the ecosystem.

READING

1. **EALR 1:** The student understands and uses different skills and strategies to read.
 - a. **Component 1.2** Use vocabulary (word meaning) strategies to comprehend text.

SOCIAL STUDIES

1. **EALR 5:** The student understands and applies reasoning skills to conduct research, deliberate, form, and evaluate positions through the processes of reading, writing, and communicating.
 - a. **Component 5.2:** Uses inquiry-based research.

WRITING

1. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.
 - a. **Component 2.1:** Adapts writing for a variety of audiences.

ADDITIONAL RESOURCES AND ENRICHMENT:

<http://astro.unl.edu/naap/motion3/animations/sunmotions.swf>

SOIL AND THE ENVIRONMENT

<http://soils.gsfc.nasa.gov/ped/spheres.gif>

ANALEMMA

http://spaceplace.nasa.gov/en/educators/NMP_timekeeping.pdf

VOCABULARY TERMS:

- **Aspect:** The direction a slope faces
- **Snowpack:** The seasonal accumulation of snow in the winter that is available for melting in the spring and summer.
- **Solstice:** Either of two times of the year when the sun is at its greatest distance from the celestial equator. The summer solstice in the Northern Hemisphere occurs about June 21, when the sun is in the zenith at the tropic of Cancer; the winter solstice occurs about December 21, when the sun is over the tropic of Capricorn. The summer solstice is the longest day of the year and the winter solstice is the shortest
- **Equinox:** Either of the two corresponding moments of the year when the Sun is directly above the Earth's equator. The vernal equinox occurs on March 20 or 21 and the autumnal equinox on September 22 or 23, marking the beginning of spring and autumn, respectively, in the Northern Hemisphere (and the reverse in the Southern Hemisphere). The days on which an equinox falls have about equal periods of sunlight and darkness.
- **Analemma:** A graduated scale in the shape of a figure eight, indicating the sun's declination and the equation of time for every day of the year and usually found on sundials and globes.
- **Blackbody absorption:** an ideal black substance that absorbs all and reflects none of the radiant energy falling on it.



**Elwha River Restoration
Aspect and Soil Moisture
Reflection Journal 1**

What does moisture of soil have to do with the way trees grow?

What questions do you have about soil moisture?



**Elwha River Restoration
Aspect and Soil Moisture
Vocabulary Notes**

Aspect:

Snowpack:

Solstice:

Equinox:

Analemma:

Blackbody absorption:



**Elwha River Restoration
Aspect and Soil Moisture
Reflection Journal 2**

Why is soil moisture important to the structure of an ecosystem?

What questions do you have about the role soil moisture plays in an ecosystem?

DEMONSTRATION #7:

Take snow (shaved ice) and place it in a metal pan in the freezer to keep frozen.

When ready, take the pan out of the freezer and place into the refrigerator to keep it cool, but above the freezing point. The goal is to show melting ice, without it being so excessive that it overwhelms the demonstration. Imbed a dark object (such as a rubber stopper) on top of the ice. Place a hot lamp (preferably a 100W light bulb or a flood lamp) above it (while still in the refrigerator) and have it shining on the snow and stopper and close the door. Check back on the snow every few minutes and watch as the snow near the stopper melts faster than the rest of the snow. The stopper ought to sink into a hole forming in the center of the snow.

